MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

BMM1014 – MATHEMATICS FOR MANAGERS

(All Sections/Groups)

15 OCTOBER 2019
2.30 p.m - 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with 4 questions only.
2. Attempt all **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.

QUESTION 1

(a) A bubble milk tea chain just started to operate on June 2019. The monthly fixed cost incurred by the owner is RM45,500 and the variable cost for each cup of bubble milk tea is RM7.85. The selling price for each cup of bubble milk tea is RM14.90.

(i) Find the total cost, total revenue and total profit function.

(4 marks)

(ii) What should be the level of sales for the owner to achieve break even?

(4 marks)

(iii) What should be the level of sales if the owner would like to realise a 35% profit over the cost of making the bubble milk tea?

(5 marks)

(b) A concert will be held in an indoor stadium that has a capacity of 14,000 seats. The tickets will be priced at RM258 for Zone 1, RM158 for Zone 2 and RM98 for Zone 3. The concert has set a rule where the ticket for Zone 3 must be equivalent to 75% of the sum of tickets from Zone 1 and Zone 2. How many tickets of each zone should be sold (assuming that all tickets can be sold) to bring in RM2.144 million in sales revenue?

(12 marks)

(Total: 25 marks)

Continued...

QUESTION 2

Amaze Publishing Company publishes two types of magazines on a monthly basis: a sport & fitness guide and a home decorating guide. The company distributes the magazines free to business, hotels, and stores in Melaka. The company's profits come exclusively form the paid advertising in the magazines. Each of the sport & fitness guide distributed generates RM3.20 per magazine in advertising revenue, whereas the home decorating guide generates RM4.80 per magazine. The sport & fitness guide cost RM1.25 per magazine to print, whereas home decorating magazine is a more sophisticated publication that includes colour photos, therefore it costs RM2.50 per magazine to print. The publishing company has a printing budget of RM10,000 per month. That is enough rack space to distribute at most 6,000 magazines each month. In order to entice businesses to place advertisement, Amaze Publishing promises to distribute at least 800 copies of sport & fitness magazine and at least 1,000 copies of home decorating magazine.

(a) Formulate the above problem as a Linear Programming problem to maximize its advertising revenue.

(6 marks)

(b) Graph and show the feasible region of the above problem clearly.

(5 marks)

(c) How many copies of each magazine should be printed each month in order to obtain maximum advertising revenue? What is the maximum revenue?

(11 marks)

(d) Will the optimal solution change if the advertising revenue for each home decorating magazine increase to RM6.50? If so, what is the new optimal solution?

(3 marks)

(Total: 25 marks)

Continued...

QUESTION 3

(a) Jane deposited RM 8,800 in a simple interest account that pays 4.5% interest annually. If Jane leaves the money in the account for 12 years, how much total money would be in the account?

(3 marks)

(b) RM 2,000 is placed in an account at 4% per year compounded continuously for two years. It is then withdrawn at the end of two years and placed in another bank at the rate of 6% per year compounded quarterly for 4 years. What is the balance in the second account after the four years?

(9 marks)

(c) A bank loans a customer RM 50,000 to purchase a bike at 4.5% interest per year compounded monthly. The customer agrees to make monthly payments for the next 15 years. How much should the monthly payment be if the debt is to be retired in 15 years?

(5 marks)

(d) The cash price of an automobile is RM 180,000. The buyer is willing to finance the purchase at 3.45% compounded monthly and to make payments of RM 1,550 at the end of each month for nine years. Find the down payment that will be necessary. How much interest will the buyer should expect to pay over the loan period?

(8 marks)

(Total: 25 marks)

Continued...

QUESTION 4

(a) Evaluate the following.

$$\int_0^1 \frac{x}{\sqrt{(x^2+1)}}dx$$

(5 marks)

(b) A local company that manufacture furniture has a cost function of $C(x) = -0.01x^2 + 12x + 200$ and a demand function of $P = 140 - 0.2x$. Find

(i) the total revenue function. (2 marks)
(ii) the profit function. (2 marks)
(iii) the level of production, x which will maximise the profit. (4 marks)
(iv) the maximum profit when the profit is maximised. (1 mark)

(c) A firm manufacture two types of washing machine: type A and type B. The yearly revenue and cost functions are given as follow.

$$R(x, y) = 4xy + 4y + 24$$
$$C(x, y) = 4x^2 + 2y^2$$

Where x is the thousand units of type A and y is the thousand units of type B. Find the number of units of each type of washing machine that should be manufactured in order for the company to maximise the profit. What is the maximum profit?

(11 marks)

(Total: 25 marks)

Continued...

LIST OF FORMULA

1. Quadratic Formula

The solution of the equation:
$ax^2 + bx + c = 0$,
$a \neq 0$, are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Simple Interest

Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$, where $i = r/m$, and $n = mt$ (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

Continued...

9. Amortization Formula

$$R = \left[\frac{Pi}{1-(1+i)^{-n}} \right]$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \left[\frac{Si}{(1+i)^{n}-1} \right]$$

(R = periodic payment required to accumulate S dollars over n periods)

11. Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ (Contribution per unit = unit selling price – unit variable cost)

Sales (unit) = $\frac{\text{Fixed cost + Target profit}}{\text{Contribution per unit}}$

Calculus

12. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

13. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

End of Paper